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To Mr. Thong Q. Nguyen

Art Unit 2872

July 17, 2006

Via fax 571 273 8300

US 08/809,620

- I - Reply to Action of 02/16/06
- II - Claims listing
- III - No new matter

To replace the yesterday Fax

Goulven VERNOIS

Fax 33 02 97 61 11 27

- VI WORKING DOCUMENTS FOR SUBSTITUTE SPECIFICATION under 37 CFR 1.121 (b)(3) and 1.125 (b) (c) showing absence of new matter

Prior version (TE20010528c)

IMPROVED TELESCOPE

FIELD OF THE INVENTION

The invention concernes the space telescopes and large membraneous mirrors.

STATE OF THE FORMER ART

PERKINS and ROHRINGER (US 4 093 351), LE GRILL (Fr 2 662 512), and many other authors describe membranous mirrors tied to a peripheral rigid structure and stiffened and shaped by means of electric charges.

SILVERBERG, (WO 94/10721), describes a double flag membranous mirror, stiffened by surface charges, and shaped by outside fields created by a rigid support.

BUI-HAI et NHU (US 5 182 512) describes, for use in ultra hight frequency, a mirror obtained by curing a rotating resin.

LENINGRAD PREC MECH OPTI, (SU 1615 655 A) describes a monolithic mirror self shapable made up of two piezoelectric thin plates closely in contact on their whole surface, this mirror being curved overall by a single electrode acting on one of the plates, and locally by discrete electrodes acting on the other plate.

ANDREAS THEODORO AUGOUSTI (GB 2 247 323 A) describes a monolithic mirror self shapable made up of a deformable substrate covered on a face by a reflective surface and on the other face by a network of electrical conductors, the whole being located in a magnetic field with which the currents circulating in the conductors react.

In these two last mirrors the electrodes or conductors in contact with the reflective surface oblige to a high thickness and/or a high rigidity to minimize the surface defects induced by these electrodes or conductors generative of electric and thermal constraints.

None the preceding authors describes or evokes the folding of the mirrors.

SUMMARY OF THE INVENTION

Space telescope comprising at least a membraneous mirror 1 and a actuating membrane 2 for shaping mirror 1.

Parabolic membranes. The membraneous mirror 1 and the actuating membrane 2, are made by spreading a liquid film 3 which hardens on the surface of a liquid 4 contained in a circular container 5 rotating around a vertical axis.

The mirror 1 and the actuating membrane 2 are tied together by means of their centrales flanges 2.1 or 2.2, either directly or by means of a cylinder 6.

Magnetic dipole. A magnetic dipole parallel to the optical axis is rigidly tied to the telescope.

If one electrode is implemented by a spiral shaped surface design, it works by electrostatic effect when no current flows, and by magnetic effect when a current is present.

BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 - Mirror 1 and actuating membrane 2

Fig. 2, 3 - Membrane 2 on rotating liquid.

Fig. 4, 5 - Ring and handle for handling of the membrane 2.

Fig. 6 - Membrane with downward flanges.

Fig. 7 Membrane with upward flanges.

Fig. 8, 9, 10 - Folding of the mirror.

DETAILED DESCRIPTION

Mirror and actuating membrane.

First preferred implementation (Fig. 2).

On takes a liquid 4 in an horizontal container 5 rotating smoothly around a vertical axis. Then, a small amount of another liquid 3 is poured over it all the way to the edge 5.1 of container 5.

This new liquid will wet the edge 5.1 and will solidify by spontaneous or induced curing thereby creating a membrane 2.

Second preferred implementation. It differs from the one before in that the liquid 3 contains a dissolved product which, after evaporation of the liquid 3, will leave a film onto the underlying liquid.

In a variant case, liquid 3 also contains suspended fibers.

Third preferred implementation (Fig. 2). In this case, the liquid 3 only contains suspended fibers which, after evaporation, will create a fibrous layer susceptible to receive a resin that can be cured.

A smoothing layer is superimposed on the composite layer so that the roughness of this composite layer does not showing at the surface of the smoothing layer, or be smaller as a pre set value.

Fourth preferred implementation. It differs from the first in that the liquid 3 is obtained by simultaneous or consecutive addition of two different liquids.

Fifth preferred implementation. Liquid 3 is absent, and the membrane 2 is created by a liquid or a gaz that solidifies directly onto the surface of the main liquid 4.

Reflecting layer. A reflecting medium is put on the membrane while it is still on the rotating liquid 4, namely by the stacking layers having appropriate dielectric indices and appropriate thicknesses.

Surface designs. While it is still on main liquid 4, the membrane 2 is locally covered, by means in accordance with the former art, with a conducting covering in the shape of surface designs 7, in so doing creating a number of annular electrodes centered on the optical axis, acting upon the radius of curvature, and a number of local electrodes acting upon local defects.

Electronic spread in the membrane. The membrane 2, while still on liquid 4, is locally covered, by means of the former art, with a thin structure identical to that of an integrated multilayer circuit having conducting, insulating or semi conducting elements, contiguous or superimposed.

Electrical supply of these surfaces designs is provided by surface conductors linked to a power supply through the center of the membrane.

These surface designs IC, when integrated to the actuating membrane of the mirror, allows, according to the invention, through the use of a capacitive coupling between the membrane and the mirror, a self control of the distance between mirror and membrane, and consequently the stabilization of the shape of the membranes without the intervention of the central system.

Actuating coils. Telescope is fitted at its bottom, at the level of the mirror, with a coil made of conducting elements.

The coil so created generates, when activated by an electric current, a magnetic field parallel to the axis of the telescope.

Discrete coils 7 of the actuating membrane will interact with this magnetic field, so as to maintain the desired shape of said

membrane and to keep it centered on the optical axis of the telescope.

The membrane 2 fitted with coils 7 has only an approximate shape, and the final shape is given to the mirror membrane 1 by the electrostatic forces existing between the conducting surface 8 of the mirror membrane and electrodes 9 present on membrane 2.

Mirror control. Surface electronic circuits integrated to the membrane during manufacturing, control the potentials of the electrodes acting upon the mirror, as well as the magnetic field of the membrane coils and the magnetic field of the telescope.

The metallised surface 8 of the mirror 1, or any conducting surface, should the reflective surface be dielectric, will initially be at 0 potential.

Electrodes 9 of actuating membrane 2 are set at positive or negative potentials, and as a result, decrease or increase the relative distance between mirror and actuating membrane.

In this manner, important local distorsion of the actuating membrane 2 will not prevent getting a perfect shape for the mirror.

Macro and micro controls. The system, according to claim, separates long range action acting on the actuating membrane through magnetic fields interacting with the field of the coil, and short range action acting through electric field between membranes.

Rotating container.

First preferred implementation (Fig. 4 and 5). The edge 5.1 of a circular rotating container 5 is surmounted and in contact with a ring 10 having handling means 11, such as handles allowing this ring to be grabbed and taken away from the edge.

The membrane 2 created when the film 3 solidifies, will stick the ring 10 thereby allowing this handling.

Second preferred implementation (Fig. 6). The outside wall 5.2 of the container is a surface of revolution.

The membrane 2 extends, by means of former art, with equal or greater thickness, on the outside wall 5.2 of the container, previously coated with a non sticking product, and in so doing creating a peripherical flange 2.3 that increases the stiffness of this periphery, thereby allowing it to recover better and faster its original shape.

It ends with a thicker band allowing handling.

In a variation (Fig. 7), the membrane extends on the inside wall of the container in the shape of a flange 2.4 higher than the rotating liquid.

Third preferred implementation (Fig. 6). The container 5 has a central circular hole 5.3 limited by a wall 5.4 holding the liquid.

The external surface 5.5 of wall 5.4 (facing the axis) has the shape of a cylindrical or conical surface of revolution.

The membrane 2 is extended, with increased thickness, on the external surface 5.5, in so doing creating an annular central flange 2.1.

Fourth preferred implementation. In a variation, the membrane is extended, by a flange 2.2, in the inside surface of the wall of the container and therefore raised above the rotating liquid.

Two examples of arrengement (fig. 43) show parallel membranes and back to back membranes.

Mirror and membrane folding (Fig. 8, 9, 10). The mirror 1 and the actuating membrane 2 are made totally or in part of a material with shape memory.

After manufacturing, the mirror 1 and the membrane 2 are distorted in such a way that this distorsion is retained until new conditions appear, that brings back the initial shape.

The membranes are concave; if one pushes (Fig. 8) the bottom of the concavity, at its center and perpendicularly to the tangent plane, it results a symmetrical circular distorsion which will intrude into the concavity.

Examination of this previously concave surface then reveals a concave peripheral ring and a central convex surface.

This central convex surface is equally pushed in the same conditions as before, and a new element of concave centered surface can be seen.

Pursuing with the creation of alternately concave and convex surfaces, one obtains a surface resembling a series of circular, centered waves (Fig. 8, 9, 10).

The thickness of this folding can be small as one wishes. It only requires an increase in the number of waves.

Once these waves fixed according to proper physical conditions, the almost flat object so obtained can be scrolled lengthwise.

Amended prior version

IMPROVED TELESCOPE

FIELD OF THE INVENTION

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PERKINS and ROHRINGER (US 4 093 351), LE GRILL (Fr 2 662 512), and many other authors describe membranous mirrors tied to a peripheral rigid structure and stiffened and shaped by means of electric charges.

SILVERBERG, (WO 94/10721), describes a double flag membranous mirror, stiffened by surface charges, and shaped by outside fields created by a rigid support.

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ANDREAS THEODORO AUGOUSTI (GB 2 247 323 A) describes a monolithic mirror self shapable made up of a deformable substrate covered on a face by a reflective surface and on the other face by a network of electrical conductors, the whole being located in a magnetic field with which the currents circulating in the conductors react.

In these two last mirrors the electrodes or conductors in contact with the reflective surface oblige to a high thickness and/or a high rigidity to minimize the surface defects induced by these electrodes or conductors generative of electric and thermal constraints.

None the preceding authors describes or evokes the folding of the mirrors.

HUTCHINSON et all (US Patent N° 5,237,337) describe the folding of a concave metallic membrane on a mendrel, but this folding seems be out of the topological rules.

GOAL OF THE INVENTION

The goal of the invention is to remove the defects of the former art, in particular the necessity of a heavy frame, and the inability to fold purely concave membranous mirror.

SUMMARY OF THE INVENTION

~~Space telescope comprising at least a membraneous mirror 1 and a actuating membrane 2 for shaping mirror 1.~~

Macro and micro control. The space telescope according to the invention comprises at least a membraneous mirror 1, an actuating membrane 2 for micro shape by mainly electrostatic action the mirror 1, and a magnetic field tied to the telescope for macro shape the actuating membrane 2 by electromagnetic action.

These two levels of shape control allow to avoid the disavantages of ANDREAS THEODORO AUGOUSTI

Parabolic free and without contact membranes.

The mirror 1 and the actuating membrane 2 are free to their peripheries and are tied to the telescope by means of their central parts, either directly or by means of a device.

They do not have material contact between them, exept possible common contact in central part with the telescope

Magnetic dipole for macro control A magnetic dipole centered on the optical axis and tied to the telescope generate a magnetic field axed on this optical axis and interacting with magnetic field of centered or discret coils of the actuating membrane.

~~**Parabolic membranes.** The membraneous mirror 1 and the actuating membrane 2, are made by spreading a liquid film 3 which hardens on the surface of a liquid 4 contained in a circular container 5 rotating around a vertical axis.~~

~~The mirror 1 and the actuating membrane 2 are tied together by means of their centrales flanges 2.1 or 2.2, either directly or by means of a cylinder 6.~~

~~**Magnetic dipole.** A magnetic dipole parallel to the optical axis is rigidly tied to the telescope.~~

~~If one electrode is implemented by a spiral shaped surface design, it works by electrostatic effect when no current flows, and by magnetic effect when a current is present.~~

BRIEF DESCRIPTION OF THE FIGURES

~~Fig. 1 - Mirror 1 and actuating membrane 2~~

~~Fig. 2, 3 - Membrane 2 on rotating liquid.~~

~~Fig. 4, 5 - Ring and handle for handling of the membrane 2.~~

~~Fig. 6 - Membrane with downward flanges.~~

~~Fig. 7 - Membrane with upward flanges.~~

~~Fig. 8, 9, 10 - Folding of the mirror~~

Fig 1 - Mirror 1 with actuating membrane 2 and magnetic dipoles 3 and 4.

Fig 2 - Actuating membrane 2 with electrodes

Fig 3, 4, 5, 6 - Folding of the mirror.

LIST OF THE ITEMS

1 - Membranous mirror

2 - Actuating membrane

3 - Peripheric coil inducing magnetic field

4 - Central device inducting magnetic field

5 - Circular centered electrode acting upon curvature of the actuating membrane 2

6 - Circular local electrodes having local effet on actuating membrane 2

7 - Conducting surface of the mirror 1

8 - Specific electrodes of the actuating membrane 2 acting the mirror 1

DETAILED DESCRIPTION

~~**Mirror and actuating membrane.**~~

~~**First preferred implementation** (Fig. 2).~~

~~On takes a liquid 4 in an horizontal container 5 rotating smoothly around a vertical axis. Then, a small amount of another liquid 3 is poured over it all the way to the edge 5.1 of container 5.~~

~~This new liquid will wet the edge 5.1 and will solidify by spontaneous or induced curing thereby creating a membrane 2.~~

~~**Second preferred implementation.** It differs from the one before in that the liquid 3 contains a dissolved product which, after evaporation of the liquid 3, will leave a film onto the underlying liquid.~~

~~In a variant case, liquid 3 also contains suspended fibers.~~

~~**Third preferred implementation** (Fig. 2). In this case, the liquid 3 only contains suspended fibers which, after evaporation, will create a fibrous layer susceptible to receive a resin that can be cured.~~

~~A smoothing layer is superimposed on the composite layer so that the roughness of this composite layer does not showing at the surface of the smoothing layer, or be smaller as a pre-set value.~~

~~**Fourth preferred implementation**. It differs from the first in that the liquid 3 is obtained by simultaneous or consecutive addition of two different liquids.~~

~~**Fifth preferred implementation**. Liquid 3 is absent, and the membrane 2 is created by a liquid or a gaz that solidifies directly onto the surface of the main liquid 4.~~

~~**Reflecting layer.** A reflecting medium is put on the membrane while it is still on the rotating liquid 4, namely by the stacking layers having appropriate dielectric indices and appropriate thicknesses.~~

~~**Surface designs**. While it is still on main liquid 4, the membrane 2 is locally covered, by means in accordance with the former art, with a conducting covering in the shape of surface designs 7, in so doing creating a number of annular electrodes centered on the optical axis, acting upon the radius of curvature, and a number of local electrodes acting upon local defects.~~

I - MIRROR, ACTUATING MEMBRANE, AND MAGNETIC DIPOLES

It is obvious that, when the membranous mirror 1 and the actuating membrane 2 will be unfolded in space, they do not will take back spontaneously their original perfect parabolic shapes

Magnetic field tied to the telescope

Telescope is fitted at its bottom, at the level of the mirror, with device generating magnetic field centered on the axis ot this telescope.

A circular coil made of conducting element, axed on the optical axis of the telescope, when activated by an electric current, generates a magnetic field axed to the axis of the telescope.

The magnetic field can be generated by a coil 3 of diameter egal or biger than the membranes, or by a coil or magnet 4 internal to the central holes of the membranes.

This magnetic field of the dipoles 3 or 4 interacts with the magnetic field genered by electrodes implemented on the actuating membrane, allowing a macro control of the shape of this actuating membrane.

Mirror and actuating membrane.

Surface circular electrodes on actuating membrane. The membrane 2 is locally covered, by means in accordance with the former art, with a number of annular conductive electrodes 5 centered on the optical axis, and a number of local anular conductive electrodes 6.

Actuating coils.

When they are feeded by electric current, discrete coils 5 and 6 of the actuating membrane 2 generate magnetic fields interacting with the magnetic field of the the telescope, so as to maintain the desired shape of said membrane and to keep it centered on the optical axis of the telescope.

The centered coils 5 generate an axial magnetic field acting on the radius of courvature of the actuating membrane 2, and the local coils 6 generate local magnetic fields having local actions

The actions of coils 5 and 6 give an approximate parabolic shape to the actuating membrane 2 fitted with these coils 5 and 6.

The final perfect parabolic shape is given to the mirror membrane 1 by the electrostatic forces existing between the conducting surface 7 of the mirror membrane and electrodes 8 present on actuating membrane 2.

Electronic spread in the membrane. **Stabilisation of system constituted by mirror 1 and actuating membrane 2.** The actuating membrane 2~~, while still on liquid 4,~~ is locally covered, by means of the former art, with a thin structure identical to that of an integrated multilayer circuit having conducting, insulating or semi conducting elements, contiguous or superimposed.

Electrical supply of these surfaces designs is provided by surface conductors linked to a power supply through the center of the membrane.

These surface designs IC, when integrated to the actuating membrane of the mirror, allows, according to the invention, through the use of a capacitive coupling between electrodes 8 of the actuating membrane 2 and the metallic layer 7 of the mirror ~~membrane and the mirror~~, a self control of the distance between mirror and membrane, and consequently the stabilization of the shape of the membranes without the intervention of the central system.

~~**Actuating coils**. Telescope is fitted at its bottom, at the level of the mirror, with a coil made of conducting elements.~~

~~The coil so created generates, when activated by an electric current, a magnetic field parallel to the axis of the telescope.~~

~~Discrete coils 7 of the actuating membrane will interact with this magnetic field, so as to maintain the desired shape of said membrane and to keep it centered on the optical axis of the telescope.~~

~~The membrane 2 fitted with coils 7 has only an approximate shape, and the final shape is given to the mirror membrane 1 by the electrostatic forces existing between the conducting surface 8 of the mirror membrane and electrodes 9 present on membrane 2.~~

~~**Mirror control**. Surface electronic circuits integrated to the membrane during manufacturing, control the potentials of the electrodes acting upon the mirror, as well as the magnetic field of the membrane coils and the magnetic field of the telescope.~~

~~The metallised surface 8 of the mirror 1, or any conducting surface, should the reflective surface be dielectric, will initially be at 0 potential.~~

~~Electrodes 9 of actuating membrane 2 are set at positive or negative potentials, and as a result, decrease or increase the relative distance between mirror and actuating membrane.~~

~~In this manner, important local distorsion of the actuating membrane 2 will not prevent getting a perfect shape for the mirror.~~

Macro and micro controls. The system, according to the invention, separates long range action acting on the actuating membrane through the telescope magnetic field interacting with the fields generated by current flowing in electrodes 5 or 6 of the actuating membrane, and short range action acting through electric fields between metallic layer 7 of the membranous mirror and electrodes 8 of the actuating membrane.

~~**Macro and micro controls**. The system, according to claim, separates long range action acting on the actuating membrane through magnetic fields interacting with the field of the coil, and short range action acting through electric field between membranes.~~

~~**Rotating container**.~~

~~**First preferred implementation** (Fig. 4 and 5). The edge 5.1 of a circular rotating container 5 is surmounted and in contact with a ring 10 having handling means 11, such as handles allowing this ring to be grabbed and taken away from the edge.~~

~~The membrane 2 created when the film 3 solidifies, will stick the ring 10 thereby allowing this handling.~~

~~**Second preferred implementation** (Fig. 6). The outside wall 5.2 of the container is a surface of revolution.~~

~~The membrane 2 extends, by means of former art, with equal or greater thickness, on the outside wall 5.2 of the container, previously coated with a non-sticking product, and in so doing creating a peripherical flange 2.3 that increases the stiffness of this periphery, thereby allowing it to recover better and faster its original shape.~~

~~It ends with a thicker band allowing handling.~~

~~In a variation (Fig. 7), the membrane extends on the inside wall of the container in the shape of a flange 2.4 higher than the rotating liquid.~~

~~**Third preferred implementation** (Fig. 6). The container 5 has a central circular hole 5.3 limited by a wall 5.4 holding the liquid.~~

~~The external surface 5.5 of wall 5.4 (facing the axis) has the shape of a cylindrical or conical surface of revolution.~~

~~The membrane 2 is extended, with increased thickness, on the external surface 5.5, in so doing creating an annular central flange 2.1.~~

~~**Fourth preferred implementation**. In a variation, the membrane is extended, by a flange 2.2, in the inside surface of the wall of the container and therefore raised above the rotating liquid.~~

~~Two examples of arrengement (fig. 43) show parallel membranes and back to back membranes.~~

<u>II - MIRROR AND MEMBRANE FOLDING (Fig. 4, 5, 6, 7)</u> ~~**Mirror and membrane folding** (Fig. 8, 9, 10)~~. The mirror 1 and the actuating membrane 2 are made totally or in part of a material with shape memory.

After manufacturing, the mirror 1 and the membrane 2 are distorted in such a way that this distorsion is retained until new conditions appear, that brings back the initial shape.

The membranes are concave; if one pushes (Fig. 8) the bottom of the concavity, at its center and perpendicularly to the tangent plane, it results a symmetrical circular distorsion which will intrude into the concavity.

Examination of this previously concave surface then reveals a concave peripheral ring and a central convex surface.

This central convex surface is equally pushed in the same conditions as before, and a new element of concave centered surface can be seen.
Pursuing with the creation of alternately concave and convex surfaces, one obtains a surface resembling a series of circular, centered waves (Fig. 8, 9, 10).
The thickness of this folding, that is the vertical crest to crest distance, can be small as one wishes. It only requires an increase in the number of waves.
For example, the figure 6 shows a cut in a concave membrane of any diameter, with a great number of waves.
For practical drawing reasons, in particular for scale, the waves are invisible, and this cut is shown by a narrow line, however large is the concave membrane.
Once these waves fixed according to proper physical conditions, the almost flat object so obtained can be ~~scrolled lengthwise~~ wound onto itself, as a flat paper circular disk..

- II - SUBSTITUTE SPECIFICATION under 37 CFR 1.121 (b)(3)

Working document showing no new matter

Each relevent paragraph of the substitute specification is put in connection with relevent paragraphs or lines of the immediate prior version (TE20010528c) filed on June 28, 2001, or of the original filed claims (TE980131), or with the original specfication, translation of the international published PCT text WO 96/10207, or the drawings of this PCT text.

Each relevent paragraphe is put in relation with former texts in italics, and former texts are in 9 points police

OPTICAL DEVICE

FIELD OF THE INVENTION

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STATE OF THE FORMER ART

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ANDREAS THEODORO AUGOUSTI (GB 2 247 323 A) describes a monolithic mirror self shapable made up of a deformable substrate covered on a face by a reflective surface and on the other face by a network of electrical conductors, the whole being located in a magnetic field with which the currents circulating in the conductors react.

In these two last mirrors the electrodes or conductors in contact with the reflective surface oblige to a high thickness and/or a high rigidity to minimize the surface defects induced by these electrodes or conductors generative of electric and thermal constraints.

None the preceding authors describes or evokes the folding of the mirrors.

HUTCHINSON et all (US Patent N° 5,237,337) describe the folding of a concave metallic membrane on a mandrel, but this folding seems be out of the topological rules.

GOAL OF THE INVENTION

The goal of the invention is to remove the defects of the former art, in particular the necessity of a heavy frame, and the inability to fold purely concave membranous mirror.

SUMMARY OF THE INVENTION

Macro and micro control. The space telescope according to the invention comprises at least a membraneous mirror 1, an actuating membrane 2 for micro shape by mainly electrostatic

action the mirror 1, and a magnetic field tied to the telescope for macro shape the actuating membrane 2 by electromagnetic action.

These two levels of shape control allow to avoid the disavantages of ANDREAS THEODORO AUGOUSTI.

These elements are soon in TE20010528c, page 24, line 10 :

Magnetic dipole. A magnetic dipole parallel to the optical axis is rigidly tied to the telecope.

Page 25, line 34 :

Actuating coils. The telescope is fitted at its bottom, at the level of the mirror, with a coil made of conducting element.

Page 26, line 20 :

Macro and micro controls. The system, acording to claim, separate long range action acting on the actuating membrane through magnetc fields interacting with the field of the coiln and short range action acting through electrc field between membranes.

It is obvious that the macro and micro control require that the membranous mirror and the actuating membrane do not have contact between them or with telescope device, except in their central parts, with the telescope.

Parabolic free and without contact membranes.

The mirror 1 and the actuating membrane 2 are free to their peripheries and are tied to the telescope by means of their central parts, either directly or by means of a device.

These elements are in original filed claim 1f, translation of published international PCT text WO 96/10207 :

f) the mirror and its actuating membrane are constituted by concentric membranes, free at their peripheries and tied by their central parts, directly or by an intermediate device

These elements are too in TE20010528c, page 28, line 7 :

The mirror 1 and the actuating membrane 2 are tied together by means of their centrales flanges 2.1 or or 2.2, either directly or by means of a cylinder 6

They do not have material contact between them, exept possible common contact in central part with the telescope

Original PCT figures 1, 27, and 43, show clearly that the membranous mirror and the actuating membrane do not have contact between them, except maybe at their central part.

We can soon conclude absolutly, from the upper elements, that the membranes are free and without contact between them or with an other device, except in their central parts wit the telescope

Magnetic dipole for macro control A magnetic dipole centered on the optical axis and tied to the telescope generate a magnetic field axed on this optical axis and interacting with magnetic field of centered or discret coils of the actuating membrane.

Soon seen upper

BRIEF DESCRIPTION OF THE FIGURES

Fig 1 - Mirror 1 with actuating membrane 2 and magnetic dipoles 3 and 4.

Fig 2 - Actuating membrane 2 with electrodes 5 and 6

Fig 3, 4, 5, 6 - Folding of the mirror.

LIST OF THE ITEMS

1 - Membranous mirror

2 - Actuating membrane

3 - Peripheric coil inducing magnetic field

4 - Central device inducting magnetic field

5 - Circular centered electrode acting upon curvature of the actuating membrane 2

6 - Circular local electrodes having local effet on actuating membrane 2

7 - Conducting surface of the mirror 1

8 - Specific electrodes of the actuating membrane 2 acting the mirror 1

DETAILED DESCRIPTION

I - MIRROR, ACTUATING MEMBRANE, AND MAGNETIC DIPOLES

It is obvious that, when the membranous mirror 1 and the actuating membrane 2 will be unfolded in space, they do not will take back spontaneously their original perfect parabolic shapes

Magnetic field tied to the telescope

Telescope is fitted at its bottom, at the level of the mirror, with device generating magnetic field centered on the axis ot this telescope.

A circular coil made of conducting element, axed on the optical axis of the telescope, when activated by an electric current, generates a magnetic field axed to the axis of the telescope.

The magnetic field can be generated by a coil 3 of diameter egal or biger than the membranes, or by a coil or magnet 4 internal to the central holes of the membranes.

This magnetic field of the dipoles 3 or 4 interacts with the magnetic field genered by electrodes implemented on the actuating membrane, allowing a macro control of the shape of this actuating membrane.

Soon seen upper.

Mirror and actuating membrane.

Surface circular electrodes on actuating membrane. The membrane 2 is locally covered, by means in accordance with the former art, with a number of annular conductive electrodes 5 centered on the optical axis, and a number of local anular conductive electrodes 6.

Actuating coils..

When they are feeded by electric current, discrete coils 5 and 6 of the actuating membrane 2 generate magnetic fields interacting with the magnetic field of the the telescope, so as to

The membranes are concave; if one pushes (Fig. 3) the bottom of the concavity, at its center and perpendicularly to the tangent plane, it results a symmetrical circular distorsion which will intrude into the concavity.

Examination of this previously concave surface then reveals a concave peripheral ring and a central convex surface.

This central convex surface is equally pushed in the same conditions as before, and a new element of concave centered surface can be seen.

Pursuing with the creation of alternately concave and convex surfaces, one obtains a surface resembling a series of circular, centered waves (Fig. 4, 5, 6).

The thickness of this folding, that is the vartical crest to crest distance, can be as small as one wishes. It only requires an increase in the number of waves.

For example, the figure 6 shows a cut in a concave membrane of any diameter, with a great number of waves.

For practical drawing reasons, in particular for scale, the waves are invisible, and this cut is shown by a narrow line, however large is the concave membrane.

Once these waves fixed according to proper physical conditions, the almost flat object so obtained can be wound onto itself, as a flat paper circular disk, allowing an easy transport and an easy launch..

Soon in TE20010528c, page 27, line 17

maintain the desired shape of said membrane and to keep it centered on the optical axis of the telescope.

The centered coils 5 generate an axial magnetic field acting on the radius of courvature of the actuating membrane 2, and the local coils 6 generate local magnetic fields having local actions

The actions of coils 5 and 6 give an approximate parabolic shape to the actuating membrane 2 fitted with these coils 5 and 6.

The final perfect parabolic shape is given to the mirror membrane 1 by the electrostatic forces existing between the conducting surface 7 of the mirror membrane and electrodes 8 present on actuating membrane 2.

Soon seen upper

Macro and micro controls. The system, according to the invention, separates long range action acting on the actuating membrane through the telescope magnetic field interacting with the fields generated by current flowing in electrodes 5 or 6 of the actuating membrane, and short range action acting through electric fields between metallic layer 7 of the membranous mirror and electrodes 8 of the actuating membrane.

Soon seen upper

Electronic spread in the actuating membrane. Stabilisation of system constituted by mirror 1 and actuating membrane 2. The actuating membrane 2 is locally covered, by means of the former art, with a thin structure identical to that of an integrated multilayer circuit having conducting, insulating or semi conducting elements, contiguous or superimposed.

Electrical supply of these surfaces designs is provided by surface conductors linked to a power supply through the center of the membrane.

These surface designs IC of the actuating membrane 2 allows, according to the invention, through the use of a capacitive coupling between electrodes 8 of the actuating membrane 2 and the metallic layer 7 of the mirror, a self control of the distance between mirror and membrane, and consequently the stabilization of the shape of the membranes without the intervention of a central electronic system.

Soon page 25, line 20 in TE20010528c

II - MIRROR AND MEMBRANE FOLDING (Fig.3, 4, 5, 6,). The mirror 1 and the actuating membrane 2 are made totally or in part of a material with shape memory.

After manufacturing, the mirror 1 and the membrane 2 are distorted in such a way that this distorsion is retained until new conditions appear, that brings back the initial shape.